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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

MAILED
SEP 28 2007
GROUP 1700

Application Number: 10/808,679
Filing Date: March 25, 2004
Appellant(s): FULLER ET AL.

Richard M. Klein
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/26/2007 appealing from the Office action mailed 2/23/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

| | | |
|-----------|-------------------|--------|
| 6,200,716 | FULLER et al. | 3-2001 |
| 6,251,313 | DEUBZER et al. | 6-2001 |
| 6,391,992 | PINSCHMIDT et al. | 5-2002 |

5,710,211

SATO et al.

1-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 5-12, 16, 20-27, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Deubzer et al (6,251,313).

Fuller et al disclose photoreceptor including: (a) a substrate; (b) a charge blocking layer comprising a polymer polymerized from at least one monomer including vinylbenzyl alcohol monomer; and (c) at least one imaging layer. After deposition of any electrically conductive ground plane layer, a charge blocking layer 4 can be applied thereto. Electron blocking layers for positively charged photoreceptors permit holes from the imaging surface of the photoreceptor to migrate toward the conductive layer. For negatively charged photoreceptors, any suitable hole blocking layer capable of forming a barrier to prevent hole injection from the conductive layer to the opposite photoconductive layer can be utilized.

If a blocking layer is employed, it is preferably positioned over the electrically conductive layer. The term "over," as used herein in connection with many different types of layers, should be understood as not being limited to instances wherein the layers are contiguous. Rather, the term refers to relative placement of the layers and encompasses the inclusion of unspecified intermediate layers.

The blocking layer includes a homopolymer of vinylbenzyl alcohol, a copolymer of vinylbenzyl alcohol and another monomer, or a terpolymer of vinylbenzyl alcohol and two other monomers, and the like. A preferred copolymer is poly(vinylbenzyl alcohol-vinylbenzylacetate). Mixtures of the polymers described herein may be used such as both poly(vinylbenzyl alcohol)

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and poly(vinylbenzyl alcohol-vinylbenzylacetate). The amount of vinylbenzyl alcohol in the copolymer and terpolymer ranges between about 25 and less than 100 mole percent, and more preferably between about 75 and about 95 mole percent, the balance being the other monomer or monomers such as vinylbenzylacetate. The concentration of hydroxyl groups is believed to provide the necessary conductivity and preferably should be in the range between about 5 and about 7.5 millimoles of hydroxyl group per gram of resin for optimum performance. This value is dependent on the formulation and the amount of gamma-aminopropyltriethoxysilane which is preferably added to the formulation as well. Suitable monomers for the copolymer and the terpolymer with vinylbenzyl alcohol include styrene, substituted styrenes, acrylates, methacrylates, vinyl acetate, vinyl chloride, and the like.

Poly(vinylbenzyl alcohol) is described in Jones, U.S. Pat. No. 3,879,328. The 3,879,328 patent teaches the preparation of vinylbenzyl alcohol from the hydrolysis of vinylbenzyl chloride followed by polymerization to poly(vinylbenzyl alcohol). However, the yields were low (about 5%) because the vinyl benzyl alcohol is formed in low yields from vinyl benzyl chloride (about 25 to 50%) and there is considerable difficulty in separating vinylbenzyl chloride starting material from the products vinyl benzyl alcohol and vinylbenzyl ether. Moreover, the divinylbenzyl ether that forms must be removed from the vinylbenzyl alcohol or crosslinking of the polyvinylbenzyl alcohol takes place with appreciable gel formation.

The present inventors have discovered that poly(vinylbenzyl alcohol) and poly(vinylbenzyl alcohol-vinylbenzyl acetate) can be made from poly(vinylbenzyl acetate) which itself was made from the reaction of commercially available poly(vinylbenzyl chloride) with sodium acetate. Poly(vinylbenzyl acetate) can also be made from vinylbenzyl acetate by

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free radical polymerization. Poly(vinylbenzyl acetate) is then hydrolyzed or reduced to form poly(vinylbenzyl alcohol). Partial hydrolysis or reduction of poly(vinylbenzyl acetate) produces copolymers of poly(vinylbenzyl alcohol-vinylbenzyl acetate).

Poly(vinylbenzyl alcohol), with a glass transition temperature of 136.degree. C., and the copolymers of poly(vinylbenzyl alcohol-vinylbenzyl acetate) are useful as thick undercoat layers in photoreceptors either by themselves or with gamma-aminopropyltrialkoxysilane, where alkyl is typically methyl or ethyl.

Poly(vinylbenzyl chloride) was obtained from Aldrich or Scientific Polymer Products, Ontario, N.Y., and has a weight average molecular weight (Mw) of approximately 50,000. Because the polymer is typically prepared by the free radical polymerization of vinylbenzyl chloride, the polydispersity (the ratio of Mw to Mn, the number average molecular weight) is typically between 3 and 6. The poly(vinylbenzyl chloride) is reacted with sodium acetate in polar aprotic solvents such as N,N-dimethylacetamide, N,N-dimethylformamide, N-methylpyrrolidinone, dimethylsulfoxide, and the like, at 100.degree. C. and is quantitatively converted to poly(vinylbenzyl acetate) within 16 hours. Poly(vinylbenzyl acetate), with a glass transition temperature of 38.degree. C., is then selectively reduced to poly(vinylbenzyl alcohol) with a 1 molar solution of borane-tetrahydrofuran complex, available from Aldrich. Because 1 mole of borane reduces between 1 and 1.5 moles of benzyl acetate groups on the copolymer (depending on the purity of the poly(vinylbenzyl acetate) and the reaction conditions used), it is possible to precisely control and tailor the number of alcohol groups in the poly(vinylbenzyl alcohol) and the poly(vinylbenzyl alcohol-vinylbenzyl acetate) copolymers formed. Polymers produced with more 77 mole % benzyl alcohol groups are soluble in methanol, ethanol, propanol

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and Dowanol. Polymers with less than 77 mole % benzyl alcohol groups are soluble in tetrahydrofuran and alcohol-tetrahydrofuran mixtures. All are insoluble in water.

Poly(vinylbenzyl alcohol) is insoluble in methylene chloride and tetrahydrofuran. It can be solubilized in these solvents by adding some alcohol. The molecular weights of the products produced are between 30,000 and 50,000 (weight average molecular weight).

EXAMPLE 2

Materials. Poly(vinylbenzyl chloride), catalog number M311, was obtained from Scientific Polymer Products, Ontario, N.Y., and had a weight average molecular weight M_w of about 50,000. Sodium acetate and anhydrous N,N-dimethylacetamide were obtained from Aldrich Chemical Co. Methanol and methylene chloride were obtained from Fisher Scientific.

Preparation of Poly(Vinylbenzyl Acetate). Poly(vinylbenzyl chloride) (200 grams) in N,N-dimethylacetamide (4-liters, 3,800 grams) were heated using a silicone oil bath at 200.degree. F. for 24 hours in a 5-liter, 3-neck flask under argon equipped with a mechanical stirrer, reflux condenser, argon inlet, and stopper. The resultant solution was decanted off and separated from the salts that crystallized out on cooling and was added to water at a ratio of 25 mL of polymer solution for every 1 liter of water using a Waring blender that was speed controlled with a variable transformer (Variac). The precipitated polymer was collected by filtration, washed with water and then with methanol (2 gallons). The aggregated lump that formed was vacuum dried to yield poly(vinylbenzyl acetate) with a glass transition temperature (T_g) of 38.degree. C. The lump was broken with a hammer and pulverized to a fine powder with a Waring blender. Although the conversion of chloromethyl groups to acetoxy methyl groups was

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100% as determined using ^1H NMR spectrometry, the recovered yield of poly(vinylbenzyl acetate) was only about 50% from poly(vinylbenzyl chloride).

EXAMPLE 3

Preparation of Poly(Vinylbenzyl Alcohol). Poly(vinylbenzyl acetate) (100 g, from Example 2) in anhydrous tetrahydrofuran (Aldrich, 1000 grams) was treated with 1-molar borane-tetrahydrofuran complex in tetrahydrofuran (Aldrich, 707.7 grams) and was heated at reflux for 2.5 hours in a 3-liter, 3-neck round-bottom flask equipped with a reflux condenser, mechanical stirrer, argon inlet and rubber septum. A gel formed which dispersed upon stirring. After cooling to 25.degree. C., methanol was cautiously added and vigorous out gassing took place. A clear polymer solution formed that was added to water at a ratio of 25 mL of polymer solution for every 1 liter of water using a Waring blender controlled with a variable transformer (Variac). The precipitated polymer was collected by filtration, washed with water, and then was vacuum dried. The polymer was then washed with methylene chloride or was reprecipitated from ethanol or methanol into methylene chloride and then was vacuum dried. The conversion of benzyl acetate groups to benzyl alcohol groups was quantitative as determined by ^1H NMR spectrometry. The recovered yield of poly(vinylbenzyl alcohol) with Tg of 136.degree. C. was about 50% from poly(vinylbenzyl acetate).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a basic catalyst, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the basic catalyst is a quaternary ammonium salt.

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Deubzer et al disclose that conventional basic catalysts in any hydrolysis reaction include aminosilanes, compounds liberating ammonia as a result of hydrolysis, such as divinyltetramethyldisilazane, hexamethyldisilazane, organic amine compounds, such as n-hexylamine, triethylamine, diethylamine, tributylamine, piperidine and diazabicyclooctane, organic hydroxides, in particular quaternary hydrocarbon ammonium hydroxides, such as tetramethylammonium hydroxide, tetrabutylammonium hydroxide and trimethylbenzylammonium hydroxide, and inorganic hydroxides, such as sodium hydroxide, lithium hydroxide and potassium hydroxide, and a mixture of the above mentioned compounds.

As cited above, the reference employs THF as a solvent in the reaction mixture, thus meeting the limitations of the instant claims.

Given the teaching so the reference that conventional basic catalysts include tetrabutylammonium hydroxide and trimethylbenzylammonium hydroxide, it would have been obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the catalysts taught by Deubzer et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

Claims 1, 5-14, 16, 20-22, and 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Pinschmidt, Jr. et al (6,391,992).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a solvent, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the solvent is sodium methoxide.

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Pinschmidt, Jr. et al discloses that the hydrolysis reaction from vinylacetate polymers to vinylalcohol polymers is conducted in the presence of a solvent/ catalyst. Such compounds include sodium hydroxide and/or methoxide (also well known solvents in the art).

Given the teaching so the reference that conventional basic catalysts/solvents include sodium hydroxide and/or methoxide, it would have been obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the catalysts/solvents taught by Pinschmidt, Jr. et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

Claims 1, 5-12, 16, 20-22, and 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller et al in view of Sato et al (5,710,211).

Fuller et al has been discussed above and teaches that the hydrolysis is performed in the presence of a solvent, but fails to teach or suggest to one of ordinary skill in the art to prepare the material of the reference wherein the solvent is pyridine.

Sato et al disclose a process for producing vinyl alcohol-type polymers and teaches that suitable bases/solvents suitable for use in such processes include pyridine.

Given the teaching so the reference that conventional basic compounds/solvents include pyridine, it would have been obvious to one of ordinary skill in the art to prepare the material of Fuller et al choosing to use the bases/solvents taught by Sato et al as the basic catalysts with reasonable expectation of preparing a material having decreased coating defects.

(10) Response to Argument

Appellant has argued that the Fuller et al reference failed to teach the use of a basic catalyst in its hydrolysis reaction. Fuller does not specifically state that a basic catalyst is

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preferred, however, employs a catalyst known in the art to function in a hydrolysis reaction and is not limited thereto. While appellant argues that there is no motivation to combine the teachings of the secondary references with those of the primary reference (Fuller), the examiner maintains her position as the secondary references teach that it is conventional and advantageous for a basic catalyst to be included in such a reaction. Specifically, the reference teaches that both acidic and basic catalysts are suitable in hydrolysis reactions, and lists known basic catalysts. The reference is relied upon solely for its teaching of known catalysts, not for the exact components of their reaction. While their process may employ different solvents, the reference lists known hydrolysis catalysts (a teaching of generally employed catalysts for similar processes), and there is no evidence demonstrating that such catalysts would not function in the hydrolysis reaction of Fuller. With respect to appellant's point that water is added to the reaction of Fuller which the secondary reference teaches away from, this appears to be incorrect. Example 3 which describes the process of preparing the poly(vinylbenzyl) alcohol, does not include water in the hydrolysis reaction, and only adds water after the polymer is formed during. While the borane complex is a type of catalyst, these references teach that there are other known and used catalysts for the same type of reaction, therefore one of ordinary skill in the art would have been motivated to add a basic catalyst as taught by the secondary references to increase the yield of the desired product. While the reference uses the borane complex, it is not limited thereto, thus the rejection is maintained. Furthermore, according to the Supreme Court, the teaching, suggestion, or motivation test (TSM test) is one of a number of valid rationales that could be used to determine obviousness. It is not the only rationale that may be relied upon to support a conclusion of obviousness. (*KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (2007)). In

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the instant case, all of the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

Appellant's arguments with respect to the Pinschmidt and Sato references are similar to that of combining the Fuller and Deubzer references, except in this case, the Pinschmidt and Sato references are teaching the inclusion of a various catalysts and solvents. Pinschmidt's hydrolysis reaction is discussed in column 8, lines 13-51, and detaches again, that either a known acid or basic catalyst may be employed. The reference specifically states that "... an effective level of acid or basic catalyst is added. Such catalysts are well known in the art of poly (vinyl alcohol)synthesis. Sodium or potassium hydroxide or methoxide are examples of basic catalysts..." Therefore one of ordinary skill in the art would have been motivated by that teaching to use the sodium hydroxide or methoxide catalysts taught as useful in the types of hydrolysis reactions taught by Fuller, as well as PVA hydrolysis reactions in general. Again, there is no evidence provided disputing this assertion, and all of the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

With respect to Sato, the reference teaches that suitable catalysts/ solvents to be used in producing PVA polymers include pyridine. The teaching of the reference to add pyridine to the hydrolysis reaction (column 5, lines 4-14), but the conclusion is the same for the above secondary references. All of the claimed elements were known in the prior art and one skilled in

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the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention, and the rejection is maintained.

(11) Related Proceeding(s) Appendix

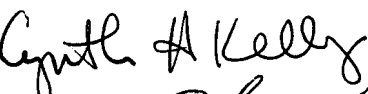

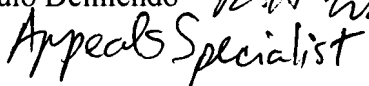
No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Amanda C. Walke 

Conferees:

Cynthia H. Kelly 
Romulo Delmendo 

Appeals Specialist